Evaluation of WHO recommendations for care of chest-indrawing pneumonia using Pneumonia Etiology Research for Child Health (PERCH) study findings

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INTRODUCTION

Integrated Management of Childhood Illness (IMCI) Pocket Book: 2013 update

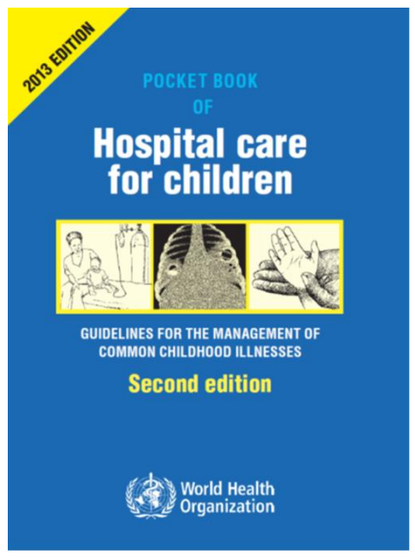
Changes from 2005 IMCI:

- Instead of hospitalization, home care is recommended for children 2-59 months without underlying conditions with chest in-drawing pneumonia (CIP)
- Evaluation by pulse oximetry for severity classification, (O2 sat <90% = severe pneumonia = hospitalization)
- Nasal flaring and grunting added as signs of respiratory distress (RD)

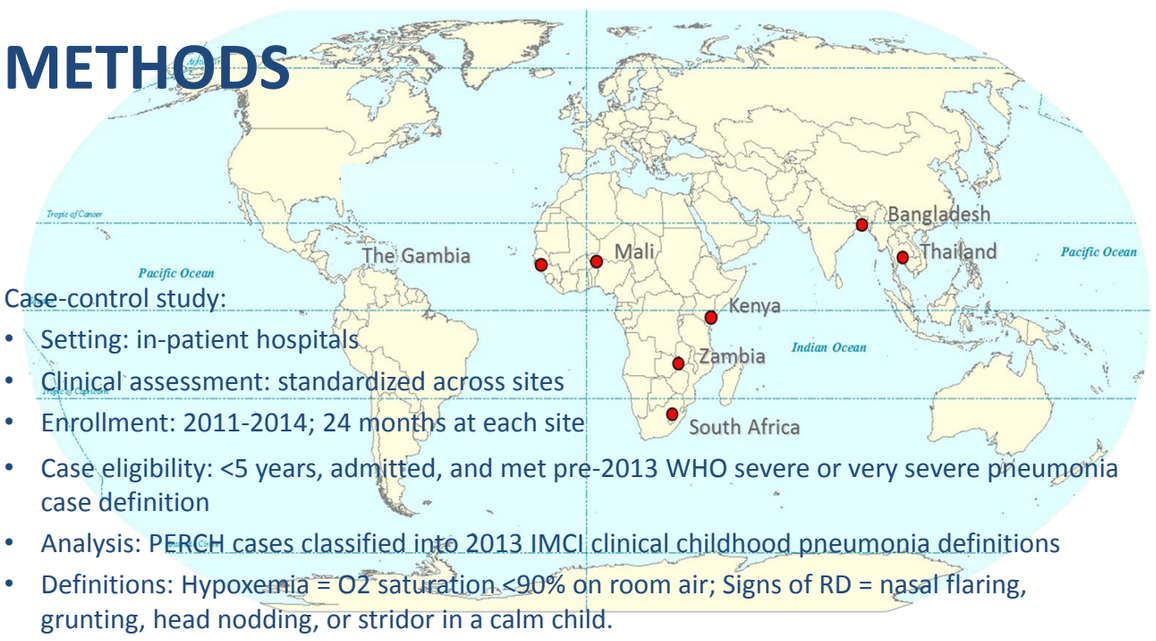
IMCI Pocket Book intended for 1st-level referral centers; also used at health centers where pulse oximetry is unavailable

We describe:

- PERCH participants who would have been eligible for home care per the new guidelines
- Clinical characteristics as potential predictors of hypoxemia among CIP cases



METHODS

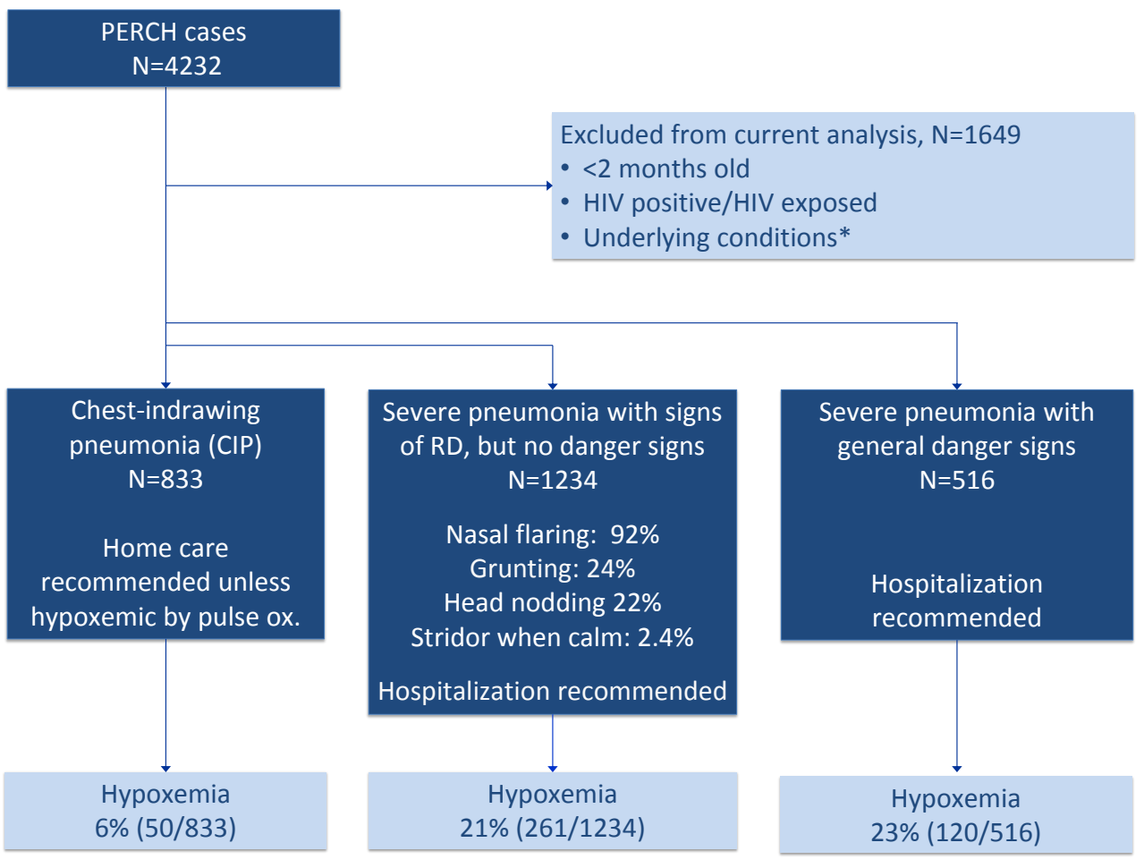


Case-control study:

- Setting: in-patient hospitals
- Clinical assessment: standardized across sites
- Enrollment: 2011-2014; 24 months at each site
- Case eligibility: <5 years, admitted, and met pre-2013 WHO severe or very severe pneumonia case definition
- Analysis: PERCH cases classified into 2013 IMCI clinical childhood pneumonia definitions
- Definitions: Hypoxemia = O2 saturation <90% on room air; Signs of RD = nasal flaring, grunting, head nodding, or stridor in a calm child.

RESULTS

FIGURE 1. Classification of PERCH cases into 2013 IMCI Pocket Book clinical definitions



*Cerebral palsy, congenital heart disease, congenital abnormalities, severe malnutrition, prematurity in an infant <6 months old.

FIGURE 1. Findings:

- 6% of CIP cases had hypoxemia with no signs of RD
- Hypoxemia was >3 times more common among cases who met 2013 IMCI severe pneumonia definitions compared to CIP cases
- The majority of severe pneumonia cases were classified as severe pneumonia due to signs of RD, not danger signs
- Nasal flaring was most common sign of RD and was the only severe pneumonia criteria for 42% (733/1750) of severe pneumonia cases

TABLE 1. Treatment failure and poor outcomes by 2013 IMCI pneumonia definitions

	2013 IMCI chest-indrawing pneumonia (CIP)		Severe pneumonia with signs of RD, but no danger signs
	Hypoxemic (hospital rec)	Not hypoxemic (home care rec)	All
	n (%)	n (%)	n (%)
Total	50 (100)	757 (100)	1234 (100)
Chest x-ray confirmed pneumonia[1]	39 (89)	337 (48)	539 (51)
Newly diagnosed HIV+ (in-hospital)	5 (10)	2 (0.3)	22 (1.8)
Indications of treatment failure[2]			
Developed danger signs within 48 hrs (A)[3]	0 (0.0)	9 (1.2)	46 (4.0)
Discharged moribund/Died in hospital (B)[4]	4 (8.0)	7 (0.9)	37 (3.0)
Any of the above (A or B)	4 (8.0)	14 (1.9)	75 (6.4)
Other poor outcomes			
O2 sat <90% at 48 hours (on room air)	5 (15)	5 (0.7)	31 (3.6)
Change in antibiotics at 48 hours[5]	0 (0.0)	28 (4.5)	61 (7.0)
Mechanical ventilation	1 (2.0)	3 (0.4)	28 (2.3)
Died within 30 days of hospital discharge[4]	0 (0.0)	6 (0.8)	3 (0.3)

[1]Presence of alveolar consolidation, other infiltrate or both among children with interpretable chest x-rays. [2]Assessed 24 and 48 hours after hospital admission. [3] Excludes children without 48 hour follow-up data due to death, discharged moribund, or missing 48 hour follow-up data. [4] Missing death data for ~10% of cases. [5] Not available for 2/7 PERCH study sites.

TABLE 1. Findings:

- Among CIP cases recommended for home care: 1.9% had indications of treatment failure, 4.5% required changes in antibiotics, and 0.8% died after hospital discharge
- Among CIP cases, hypoxemia was associated with chest x-ray confirmed pneumonia
- 4/50 (8%) of hypoxemic CIP cases were discharged moribund or died in hospital
- Hypoxemic CIP cases experienced treatment failure as frequently as hypoxemic children with easily observable signs of respiratory distress (e.g. nasal flaring)

TABLE 2. Clinical characteristics and potential predictors of hypoxemia among PERCH participants with 2013 WHO chest-indrawing pneumonia

	2013 IMCI chest-indrawing pneumonia (CIP)		
	A. Hypoxemic (hospital rec.)	B. Not hypoxemic (home care rec.)	B vs. A
	n (%)	n (%)	p-value[1]
Total	50 (100)	757 (100)	
Age			
2-5 months	18 (36)	170 (23)	.22
6-11 months	10 (20)	192 (25)	.94
12-23 months	16 (32)	240 (32)	.67
24-59 months	6 (12)	155 (21)	ref
Fever			
Temperature ≥ 38.0°C	21 (42)	187 (25)	.15
Temp ≥ 38.0°C or Fever history	43 (86)	625 (83)	.89
Difficulty breathing			
Tachypnea[2]	42 (86)	670 (89)	.44
Respiratory rate > 45 bpm	39 (80)	646 (86)	.84
Respiratory rate > 50 bpm	36 (74)	543 (72)	.33
Respiratory rate > 55 bpm	31 (63)	441 (58)	.38
Audible wheeze	2 (4)	273 (36)	.53

[1] For categorical variables, p-values obtained from logistic regression adjusting for site and age; for continuous variables, p-values obtained using Wilcoxon rank sum test. [2] Tachypnea defined as ≥50 for children 2-11 months, ≥40 for children 12-59 months.

TABLE 2. Findings:

- Among CIP cases now recommended for home care: 25% had fever and 89% had tachypnea
- Age, fever, tachypnea, and wheezing were not good predictors of hypoxemia among children with CIP

CONCLUSIONS

Under the 2013 IMCI pneumonia definitions:

- 6% of CIP cases were hypoxemic, which approximates how many cases could be incorrectly recommended for home care in settings where pulse oximetry is unavailable
- Inclusion of nasal flaring improved identification of hypoxemia and dramatically increased the number of children who met severe pneumonia criteria (i.e. recommended for hospitalization)
- ~5% of CIP cases (home care recommended) experienced poor outcomes, which highlights the need for follow-up care
- 8% of hypoxemic CIP cases without signs of RD experienced treatment failure, which was similar to pneumonia cases with signs of RD and highlights the need for pulse oximetry
- Age, fever, tachypnea, and wheezing were not good predictors of hypoxemia and cannot be used in place of pulse oximetry

References

Pocket book of hospital care for children: Guidelines for the management of common illnesses. Second edition. Geneva: World Health Organization; 2013 (http://www.who.int/maternal_child_adolescent/documents/child_hospital_care/en).

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PERCH Pneumonia Etiology Research for Child Health

IVAC International Vaccine Access Center